

2/8/18 "What hurts more, the pain of hard work or the pain of regret?" -Unknown

HW: "Sketching Polynomials" # 5, 6

Test 1 on Thursday 2/15

AIM: How do we sketch polynomials without a graphing calculator?

Warm Up:

Given:

$$f(x) = x^6 - 5x^4 - 36x^2$$

a) The complete factorization

(b) The solution set

$$= x^2(x^4 - 5x^2 - 36)$$

$$x^2(x^2 - 9)(x^2 + 4)$$

a)  $x^2(x+3)(x-3)(x^2+4)$

b)  $x=0, -3, 3, \pm 2i$

$$\begin{array}{r} x^2 + 4 = 0 \\ -4 \quad -4 \\ \hline x^2 = -4 \\ x = \pm \sqrt{-4} \\ x = \pm 2i \end{array}$$

HW check

$$\begin{array}{r|rrrr} -1 & 1 & 6 & 11 & 6 \\ & & -1 & -5 & -6 \\ \hline & 1 & 5 & 6 & 0 \end{array}$$

$$(x+1)(x^2+5x+6)$$

$$a) \boxed{(x+1)(x+2)(x+3)}$$

$$b) \boxed{x = -1, -2, -3}$$

Sketch the general graph of each function without your graphing calculator. Your sketch should contain both the x- and y-intercepts.

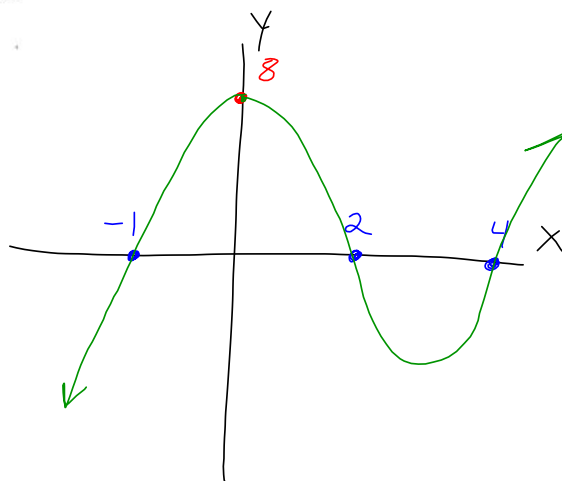
1.  $f(x) = (x+1)(x-2)(x-4)$

$x = -1 \quad 2 \quad 4$   
zeros (x-intercepts)

y-int:  $(0, 8)$

$x = 0$

$$\begin{aligned} f(0) &= (0+1)(0-2)(0-4) \\ &= 1(-2)(-4) \\ &= 8 \end{aligned}$$



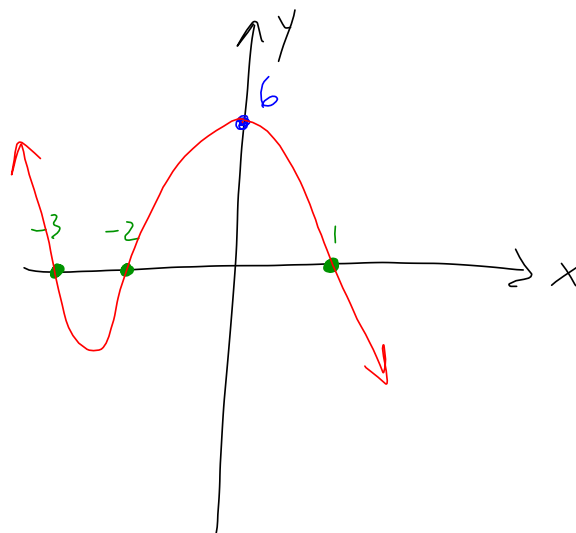
2.  $f(x) = -(x+3)(x+2)(x-1)$

zeros  $x = -3, -2, 1$

y-int:  $(0, 6)$

$x = 0$

$$\begin{aligned} f(0) &= -(0+3)(0+2)(0-1) \\ &= -(3)(2)(-1) \\ &= 6 \end{aligned}$$

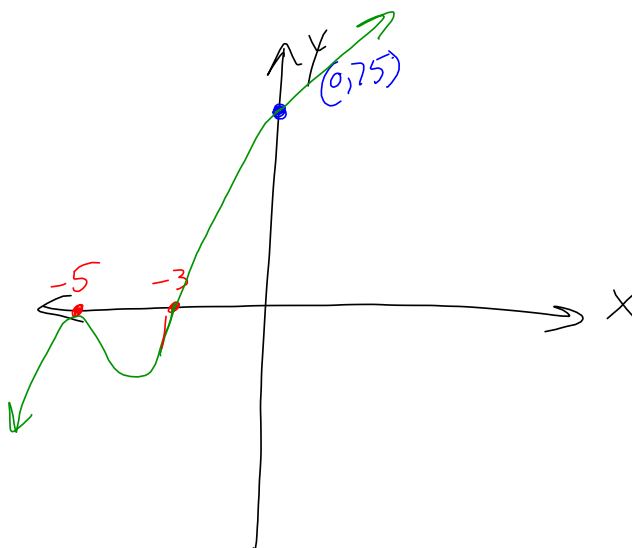


$$3. f(x) = (x+5)^2(x+3)$$

zeros  $x = -5$   $x = -3$   
 bounce cross

y-int:  $(0, 75)$   
 $x=0$

$$\begin{aligned} f(0) &= (0+5)^2(0+3) \\ &= (5)^2(3) \\ &= 25(3) \\ &= 75 \end{aligned}$$



$$4. f(x) = x^4 - 5x^2 + 4$$

$$f(x) = (x^2 - 4)(x^2 - 1)$$

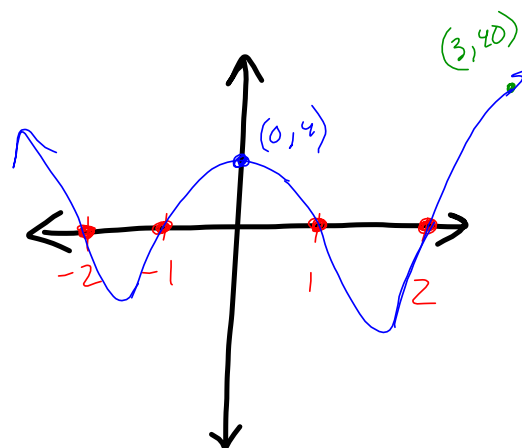
$$f(x) = (x-2)(x+2)(x-1)(x+1)$$

zeros:  $x = 2$  ,  $-2$  ,  $1$  ,  $-1$   
 cross cross cross cross

y-int:  $(0, 4)$   
 $x=0$

$$\begin{aligned} f(0) &= 0^4 - 5(0)^2 + 4 \\ f(0) &= 4 \end{aligned}$$

Another Point  
 from table  
 is  $(3, 40)$



## Steps for sketching Polynomials

- 1) Factor the polynomial
- 2) Find the zeros (set each factor = 0 and solve)
- 3) Identify what happens at each of the zeros
  - cross (the exponent of the factor is odd)
  - terrace cross (the exponent of the factor is odd and not 1)
  - bounce (the exponent of the factor is even)
- 4) Identify a point on the Polynomial  
(~~x~~ y-int is a great one) using calculator.
- 5) Sketch the polynomial starting at the point found in step 3

5.  $f(x) = x^3 + 2x^2 - 8x$

6.  $f(x) = x^3 + 2x^2 - 36x - 72$